The Aviation Detachment in the U.S. Army's Unit of Action: Full Spectrum Dominance

A Monograph
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Abstract

THE AVIATION DETACHMENT IN THE U.S. ARMY'S UNIT OF ACTION: FULL SPECTRUM DOMINANCE by Major Mark A. Moser, U.S. Army , 47 pages.

Since the Chief of Staff of the Army, General Eric K. Shinseki, announced to the Army that it would transform or become irrelevant, there has been much discussion and debate as to what direction this transformation should head. The initial tumult focused primarily on what some viewed as a radical departure in the means the Army would utilize to fight and win the nation's wars. A slow epiphany began to creep through the ranks as the weight of General Shinseki's plan started to reverberate. Many realized that transformation was not about the hardware, although that aspect will be the most visible outward manifestation of the change. Transformation is about fundamentally changing how the Army thinks about fighting. The hardware is simply the new set of tools that the Army will use to employ new concepts.

To this end, questions have arisen as to whether or not the Army is selecting the right tools and combinations of tools to craft these new concepts of how to fight. One of the key combination of tools is the pairing of the RAH-66 Comanche helicopter and the Tactical Unmanned Aerial Vehicle (TUAV) within the Unit of Action (UA) Aviation Detachment. This detachment's mission is to provide that brigade-sized combined arms organization with domination of the battlespace in terms of Information, Surveillance, and Reconnaissance, (ISR) High Pay-off Target (HPT) strike capability, and close support of the ground maneuver elements.

This paper examines the currently proposed composition of the Aviation Detachment, twelve Comanches and eight TUAVs, and attempts to evaluate this mix of platforms to determine if it will provide the Unit of Action commander with the right tools to shape his fight. In order to make this evaluation, empirical data from Aviation and Troop Command / Joint Combat And Tactical Simulation (ATCOM / JCATS) was analyzed to determine the operational performance, survivability, and sustainability of the detachment. The scenario replicated within the simulation was a high intensity, early entry scenario, a scenario in which the entire UA is supposed to be able to conduct autonomous operations for seventy-two hours.

Based on the established criteria, this paper concludes that an appropriate fusion of manned and unmanned platforms for this scenario is a two-one mix, and that with reservation, the twelve RAH-66 and eight TUAV mix did provide the commander the tools needed to accomplish his mission. The reservation is based on a potential operational gap that manifested itself during the research. With a requirement for all of the Aviation Detachment's assets to be conducting simultaneous operations for the entire seventy-two hours, a realistic possibility, a two-hour gap would appear in every eight hour cycle with no Comanches available to fill it. In order to compensate for this break in coverage, and to provide the commander with the optimal mix, the author recommends that an additional Comanche be given to each of the two troops within the detachment, and that no degradation be made to the quantity of TUAVs.

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ABBREVIATIONS

ADA – air defense artillery
ARFOR – army forces
ATCOM – aviation troop command
AVIM – aviation intermediate maintenance
AVUM – aviation unit maintenance
C2 – command and control
C4I – command, control, communications, computers, and intelligence
CONUS – continental United Status
CS – combat support
CSS – combat service support
CST – coalition support team
FARP – forward area refueling point
FCS – future combat system
HHC – headquarters and headquarters company
HHT – headquarters and headquarters troop
HPT – high priority target
ISR – intelligence, surveillance, and reconnaissance
JCATS – joint command and tactical simulation
JFLCC – joint force land component
JTF – joint task force
LOS – line of sight
MSR – Main Supply Route
NLOS – non line of sight
O&O – operational and organizational
OP – observation post
TPFDL – time phased force deployment list
TRADOC – training and doctrine command
TTP – tactics, techniques, and procedures
TUAV – tactical unmanned aerial vehicle
UA – Unit of Action
UAV – unmanned aerial vehicle
UCAR – unmanned combat aerial rotorcraft
UE – Unit of Employment

Chapter 1

INTRODUCTION

> The Objective Force is the Transformation of the entire United States Army… and it will take the dedicated efforts of the entire Army Team, the help of our sister Services, industry, academia, the Office of the Secretary of Defense, and Congress, to ensure that Transformation succeeds![1]

The Objective Force is the U.S. Army's future full-spectrum force. By full-spectrum, the Army means that the Objective Force will be organized, manned, equipped and trained to operate across the entire spectrum of military operations from Major Theater Wars (MTW) to domestic disaster relief, and a host of additional contingencies. The stated goal of the Objective Force is to be more strategically responsive, deployable, agile, versatile, lethal, survivable and sustainable.[2]

This somewhat superficial description of the Army's Objective Force has lent itself to visions of a force capable of performing military accomplishments of near mythic proportions. An Army that promises to be lighter and more agile than the current generation of forces, yet just as well-protected and considerably more lethal. Additionally, enhanced situational awareness via organic and additional sensors will afford the commanders of this force a Zen-like omnipresence throughout the battlespace. In order for the current mix of forces to transcendit's current designation as a "legacy force" and achieve Objective Force stature, it must undergo transformation. This transformation is by no means a linear process and encapsulates a complex web of evolving ideas and concepts. These ideas and concepts are constantly developing and coalescing, grappling to incorporate doctrine, training, leader development, organizations, material and solders into one coherent concept that will be the Objective Force.

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[1] LTG John M. Riggs, *Transforming the Army to the Objective Force*(Washington: Department of the Army, 2002) [article on-line]; available from http://www.objectiveforce.army.mil. Accessed 24 November 2002.

[2] Department of the Army, *United States Army White Paper: Concepts for the Objective Force*, November 2001, 1.

Since 1989, the often-sighted "end of the Cold War," the US Army has conducted small and large contingency operations nearly spanning the full spectrum of conflict. On 12 October 1999 when the Chief of Staff of the Army, General Eric K. Shinseki, unveiled the Army's plan to transform the service, the scope and magnitude of this change caught many off guard. What the Chief of Staff was describing seemed like a very new way to do business.[3]

The genesis for this change was the realization that the Army's modernization of the 1980s, often defined by the fielding of the big five, Abrams Tank, Bradley Fighting Vehicle, Apache helicopter, Blackhawk helicopter, and Patriot air defense missile, was approaching the twenty year mark with no substantive plan to address the ageing fleets.[4] It was also somewhat startling to realize that the first units of a transformed force would not be ready to fight as a cohesive force until 2010 at the earliest, and that the Objective Force would not be completely fielded until 2032.[5] This realization was also fueled by recent attempts to quickly deploy combat forces such as Task Force Hawk in Albania in 1999, and the 82d Airborne Division into Saudi Arabia in 1991. The relatively slow deployment and build-up of these forces painfully demonstrated to the Army leadership that strategic responsiveness needed to be addressed.[6] The Army had to strike a balance between the quick deployability of light forces and the combat power of heavy forces.

Central to the Army's organizational transformation is the echelonment of forces. Within these echelons reside the basic organizations that are the foundation on which the desired

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[3] Department of the Army, *United States Army White Paper: Concepts for the Objective Force*, November 2001, ii.

[4] General Eric K. Shinseki, "talking points form the Transformation Panel conducted by the Institute for Land Warfare, October 17, 2000," *Army Transformation*, [Online], Available at http://www.army.mil/usa/AUSA Web/PDF Files/MasterDeckwithnotes.pdf. Accessed 24 November 2002.

[5] Ibid.

[6] LTC Jonathan B. Brockman, *The Deployability of the IBCT in 96 hours: Fact or Myth?* (Fort Leavenworth KA: School of Advanced Military Studies, United States Army Command and General Staff College, 2001). 2.

capabilities are built. Currently there are two defined echelons, the Unit of Action and the Unit of Employment.

Units of Employment (UE), in historical terms, represent the field army, corps and divisions. They are designed to be highly tailorable with the task to integrate and synchronize Army forces for the entire range of operations at the higher tactical and operational levels. Focused on major operations and decisive land campaigns in support of joint operational and strategic objectives, units of employment participate in all phases of joint operations from initial entry to conflict termination in any form of conflict and operating environment. The UE is capable of command and control of all Army, joint, and multinational forces. Each UE is organized, designed, and equipped to fulfill command and control (C2) functions as the Army Forces (ARFOR) Component, Joint Force Land Component Command (JFLCC), or the Joint Task Force (JTF). The UE will also have the inherent capacity to interact effectively with multinational forces as well as with interagency, non-governmental organizations, and private volunteer organizations.[7]

The Unit of Action (UA) is normally a fixed organization that accomplishesa discrete sets of functions at the tactical level in accordance with its prescribed mission-essential tasks. It is represented today by the echelons of section through brigade. Units of Action will vary in size and number of organic sub-units, dependent on the battlefield functions performed by the unit and its organic capabilities. UAs are designed as modular organizations that can be combined and integrated as the basic building blocks of combined arms combat power to form larger formations such as the UE. [8]

[7]Riggs, Lt. Gen. John M. "Transforming the Army Into the Objective Force." *Army Magazine, 2001-02 Green Book*, October 2001. 95.

[8] U.S. Army, *Objective Force Unit of Employment Concept Final Coordinating Draft,* August 07, 2002, p. 6

On 22 July 2002, the Army's Operational and Organizational Plan (O&O) for the Unit of Action was released. This was literally a defining moment for the Objective Force as the linkage from capabilities to organizational structure was established. Pivotal to this document was the precept that the UA will be able to deploy from strategic distances and commit directly into any type of combat, with no additional sustainment for seventy-two hours. The Unit of Action is truly expected to be a "come as you are" fighting force. This document establishes the base fighting force organic to the Unit of Action as a signal company, a military intelligence company, three combined arms battalions, an artillery battalion, a forward support battalion, and an aviation detachment.[9]

The mission of the UA aviation detachment is very similar to that of a current air cavalry troop: perform reconnaissance and provide close support to maneuver units.[10] Exactly how this detachment conducts this mission, which will be discussed later, is the radical difference. Likewise, the key tasks embedded in this mission are similar to those routinely conducted today. Reconnaissance is conducted to develop the situation before contact, while engaging to destroy the high payoff or most dangerous target sets with external networked fires, which are under UA control, to set the conditions.

The UA Aviation Detachment itself is commanded by a major, with a captain commanding each of the two air troops. The current operational and organizational plan allots twelve helicopters to the detachment, and in a fundamental change to the normal aviation structure, the detachment has eight unmanned aerial vehicles (UAV) that are organic to it.[11] The eight are broken into two sets of four that are teamed with the troops in order to have a twenty-

[9] U.S. Army Training and Doctrine Command Pamphlet 525-3-90/O&O, *The United States Army Objective Force Operational and Organizational Plan for Maneuver Unit of Action,* July 22, 2002. 26.

[10] *Unit of Action O&O,* 41.

[11] Ibid.

four hour capability (Figure 1). The troop has a dedicated sensor team that operates and maintains the unmanned aerial vehicles.

With the cornerstone of deployability being kept in mind, the final element of the Aviation Detachment can be considered austere by current standards. The Aviation Service Troop, the equivalent of today's Aviation Unit Maintenance (AVUM) troop, is composed of only fifty-nine personnel. This is less than half of the number of soldiers in a standard AVUM, making the Service Troop considerably easier to deploy, but the trade-off in capability is substantial.[12]

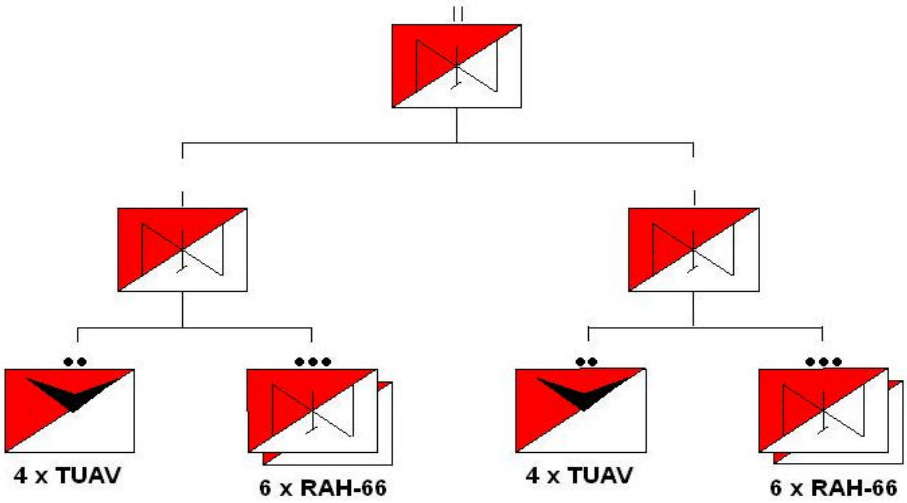

Figure 1: Graphic depiction of the two air troops in the UA Aviation detachment

Methodology

In order to view the potential effectiveness of these two highly capable systems and how they may interact together, especially since neither of them are fully-fielded yet, the only viable lens to use is tactical simulation and modeling. Within the simulation, data covering operational

[12] Jeffery L. Shafer, "Future Combat Systems" (brief given to SAMS students participating in Boeing facilitated exercise, 17-22 September 2002).

performance, survivability, and sustainability of the systems will be captured in the effort to quantify their effectiveness.

All three of these criteria will be derived from a scenario involving a pure Unit of Action against a threat that falls in the high intensity realm of the spectrum of conflict. To determine the success or failure of operational performance, the mission-related data produced by the simulation will be compared to the mission requirements to determine mission success. The survivability criteria will also utilize the scenario data contrasted to the tenants espoused by the O&O for survivability. The final criteria of sustainability will use the scenario as a basis to project sustainment requirements as compared to the Unit of Action's sustainment capabilities.

Tools of the Trade

In order to better understand the capabilities of the aviation detachment and how they were evaluated over the course of this study, it would be beneficial to understand the current and proposed capabilities of the primary systems within the detachment, the RAH-66 Comanche, the Tactical Unmanned Aerial Vehicle (TUAV), and the Unmanned Combat Armed Rotorcraft (UCAR).

The RAH-66 Comanche is the centerpiece of the detachment. It is classified as a multi-role aircraft, as is reflected by its designation as a Reconnaissance Attack Helicopter (RAH). The aircraft is intended to replace the current fleet of scout helicopters, the OH-56D Kiowa Warrior, and augment the current attack helicopter fleet of AH-64 Apaches. In order to meet this challenge, the Comanche was mandated to have improved speed, agility, aircrew visibility, reliability, availability, and maintainability over current reconnaissance and attack helicopters.[13] The helicopter is also designed for low observability (stealth) and is capable of deploying over long ranges without refueling. Even though the design requirements for the Comanche were

[13] Federation of American Scientists, "RAH-66 Comanche Systems", [Online], Available at http://www.fas.org/man/dod-101/sys/ac/docs/ord-rah-66.htm. Accessed December15, 2002.

established long before the concept of the Objective Force was established, they mesh seamlessly with one another.

Critical to achieving the Comanche's desired capabilities is the successful development and integration of advanced technologies, especially for the mission equipment package.[14] These technologies are well under way, but like its counterpart for the Objective Force ground units, the Future Combat System (FCS), some of the technologies are still to be proven.

There is nothing unique about the ordinance on board the Comanche; in fact it is rather mundane. The 20-milimeter nose mounted gun, 70-milimeter folding fin aerial rockets and the Hellfire anti-tank missile, and even the air-to-air Stinger system are all systems that have been seen on helicopters in the past. What makes the Comanche invaluable to the Unit of Action is its capability to "see first." The systems and sensors that are used to employ the on board weapons also linked to organic UA, UE, and joint fires. In addition, they provide the commander with real-time electro-optical and data feeds that are a phenomenal leap ahead of the ones currently fielded. As a comparison, the Comanche's advance infrared (IR) sensors have twice the range of the current OH-58D Kiowa Warrior and AH-64 Apache sensors. Additionally, the Comanche is fitted with an updated Apache Longbow millimeter wave radar system.

Part of the ability to "see first" resides in the aircraft's ability not to be seen by the enemy. The key to this is the low observability (stealth) capability of the aircraft. The Comanche radar cross-section (RCS) is less than that of a Hellfire missile. The Comanche's head-on RCS is 360 times smaller than the AH-64 Apache, 250 times less than the smaller OH-58D

[14] United States General Accounting Office, *DEFENSE ACQUISITION, Comanche Program Objectives Need to Be Revised to More Achievable Levels.* June 2001. 4-5. The Comanche helicopter program began in 1983 to provide a family of high technology, low-cost aircraft that would replace the Army's light helicopter fleet, which includes the AH-1 Cobra, OH-58 Kiowa, OH-6 Cayuse, and the UH-1 Iroquois (Huey). The Army subsequently decided to develop only a single Comanche aircraft capable of conducting either armed reconnaissance or attack missions. The Army intends for the Comanche to be part of its future or "objective" force.

Kiowa Warrior, and 32 times smaller than the OH-58D's mast-mounted sight. This means the Comanche will be able to approach five times closer toan enemy radar than an Apache, or four times closer than an OH-58D, without being detected. The Comanche only radiates one-half the rotor noise of current helicopters, and its susceptibility to detection and engagement by infrared systems is also phenomenally lower than the current Army helicopters because of an infrared (IR) suppression system that radiates 25 percent of the engine heat compared to that of current helicopters.[15]

One last yet extremely important aspect of the Comanche in relation to the Unit of Action is its deployability requirements. Since the Unit of Action could be deployed into any spectrum of combat, it is imperative that it be able to fight quickly upon arrival in theater. When the C-130 Hercules Transport aircraft touches down with an RAH-66 and a team of eight or less in the cargo bay, within 45 minutes of arrival that Comanche will be ready to fight (30 minutes to download, 15 minutes to refuel and rearm.) [16]

The current Operational and Organizational Plan teams eight Tactical Unmanned Aerial Vehicles (TUAV) with the twelve RAH-66 Comanches. The initial TUAV that is being fielded is the Shadow 200, which will fill the role as the detachment's primary TUAV until 2011. The Shadow 200 is a fixed wing craft with a gross weight of 328 pounds and wingspan of just under thirteen feet. These factors do make it more deployable than many of the other UAVsbut, it has some drawbacks as well. The Shadow 200 hasa relatively short range, spanning a radius of fifty miles from the control station, ground or air. The TUAV can stay airborne for just over five hours, but this includes en route time and loiter time above the target area. The miniscule payload of 60 pounds is for sensor equipment only; there is no capability to carry any external loads. The maximum altitude of 15,000 feet places it at the edge of usefulness for the recent

[15] Federation of American Scientists, "RAH-66 Comanche Systems", [Online], Available at http://www.fas.org/man/dod-101/sys/ac/rah-66.htm. Accessed December 15, 2002.

operations in Afghanistan, but overall, this would suffice. Cruise speed is between 65 – 85 knots and max speed of 123 knots,[17] A single TUAV system provides twelve hours of continuous operations within a 24-hour period. It is capable of surging to eighteen hours within a 24-hour period, for up to three consecutive days.[18]

The Unmanned Combat Armed Rotorcraft (UCAR) is the tentative replacement for the TUAV. It is currently projected to replace the TUAV in the 2011 time frame. The guidance that has been given for development of the UCAR establishes several minimal criteria. First, as a general description, it must be non-expendable, survivable, lethal Vertical Take Off and Landing (VTOL) air vehicle using heavy fuel, JP8. Secondly, the UCAR must be able to conduct global deployment and operations with the Army's initial entry force package. Thirdly, it must have system integrity consistent with surge operations over populated areas and in controlled airspace. Lastly, the command and control for the UCAR must be versatile enough to be conducted from the air and ground.[19]

Still in the developmental process, the UCAR concept has been modeled andwargamed with some very unique capabilities. It has been conceptually employed by UA Aviation Detachment forces by itself, teamed with a manned aerial vehicle, and teamed with other UCARs. The common UCAR airframe has been equipped with a dazzling array of different payloads, everything from a common missile for anti-armor operations, to anti-radiation missiles and radar jamming pods used to conduct Suppression of Enemy Air Defense (SEAD) operations in support of rotary wing attacks. The UCAR also transported small pods of rocket artillery that it emplaced on the battle field. These pods were then remotely fired to extend the range of the artillery. The UCAR acquisition systems were also linked to joint and combined fires, allowing it to detect,

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[16] Ibid.

[17] http://www.shadowtuav.com/aerialvehicle.html, accessed November 23, 2002.

[18] Global Security.Org web sight, "RQ-7 Shadow 200 Tactical UAV" [Online] http://www.globalsecurity.org/intell/systems/shadow.htm. Accessed on December15 , 2002.

identify, and engage hostile targets with any and all means available to the Unit of Action commander.

The basic attributes / requirements the UCAR had during the modeling were: the ability to range the initial battlespace observation position 250 kilometers from the center of UA battlespace; dwell time in forward battlespace of three hours at 100 kilometers per hour and 300 feet elevation; capability to cruse at a speed of 200 knots, with a hover loiter capability that varied from 100 feet for thirty minutes, to 10,000 feet for five minutes; and a total payload capacity of 400 pounds (4 Hellfire equivalents).[20]

Purpose of the Research

The teaming of the capabilities of the UCAR and the Comanche raises the question of whether or not the Army has selected the right tools and combinations of tools with which to populate the Unit of Action Aviation Detachment, which in turn will afford the Unit of Action commander the ability to dominate the battlespace in terms of Information, Surveillance, and Reconnaissance (ISR), High Pay-off Target (HPT) strike capability, and close support of the ground maneuver elements. The results of this analysis should answer the research question: Is the current proposed Aviation Detachment in the Objective Force's Unit of Action capable of conducting full-spectrum dominance as defined by the Army's Operational and Organizational Plan for the Unit of Action?

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[19] Ibid.

[20] Jeffery L. Shafer, "Future Combat Systems" (brief given to SAMS students participating in Boeing facilitated exercise, 17-22 September 2002).

Chapter 2

OPERATIONAL PERFORMANCE

The lens through which operational performance was viewed for this research was mission success. If the Aviation Detachment successfully completed its critical mission tasks, then it would be deemed as achieving operational performance success. A high intensity early entry scenario was modeled using the Aviation and Troop Command / Joint Combat And Tactical Simulation (ATCOM / JCATS) system. This was the vehicle used to obtain the information concerning task completion. The actual tasks were established by an ad hoc staff of officers from the Army War College who utilized the Military Decision Making Process (MDMP), and incorporated the basic guidance set forth in the Unit of Action Operational and Organizational (O&O) plan dated 22 July 2002. The author then reviewed the mission results data produced by ATCOM / JCATS to determine if the twelve RAH-66 Comanches and eight UCARs in the Unit of Action Aviation Detachment accomplished their assigned missions in accordance to the guidance they had received.

The guidance in the Objective Force O&O is derived from a conceptual construct known as "a quality of firsts." A quality of firsts includes four tenets; see first, understand first, act first, and finish decisively. In practical terms, this construct redefines how the Army currently does business. The implication is that at present, the Army develops the situation on the ground slowly and cautiously, but while in contact with the enemy. Therefore, the initiation of decisive action is not always at the time and place of the commander's choosing. The Objective Force, with its quality of firsts, is designed to allow the commander the opportunity to develop the situation on the ground prior to making contact, maneuver forces to a position of advantage largely out of contact, and, when ready, initiate decisive action on the commander's terms.[21]

[21] *Unit of Action O&O,* 51.

To insure the UA is able to execute its core mission tasks, each of these qualities of firsts must be considered and incorporated into each mission task.[22] Likewise, the Aviation Detachment must in turn examine how it will accomplish these qualities in respect to the UA core missions. The current O&O does provide some specified tasks to the detachment that can be interpreted as being its mission essential task.[23] The first task is to conduct reconnaissance to develop the situation before contact; this equates to see first / understand first. The second is to engage and destroy high payoff or most dangerous target sets during reconnaissance missions by employing external networked fires that reside under brigade control to set conditions; this is clearly act first. The third specified task is to provide aviation in close support of maneuver, particularly when terrain is compartmented or restricted; this requirement captures the "finish decisively" portion of the quality of firsts.

Exactly how the Aviation Detachment performs these essential tasks is yet to be delineated, but the fusion of manned and unmanned platforms appears to be what the authors of the O&O had in mind. They specified that the RAH-66 should be teamed with unmanned platforms that allow them to fuse external ISR in order to perform Reconnaissance and

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[22] *Unit of Action O&O*, 40. The UA Core mission tasks:
- Close with and destroy enemy forces or seize terrain to dominate the battlefield.
- Synchronize command and control (C2); intelligence, surveillance, and reconnaissance (ISR); maneuver, fires, survivability, and sustainment.
- Develop the situation with external and organic ISR, Army and joint, to satisfy core information requirements in the fidelity needed to meet mission, task and purpose of each echelon in the UA.
- Prepare the battle space to set conditions for tactical maneuver and protect with external and internal fires, Army and joint.
- Conduct offensive operations to fight and win simultaneous, multiple engagements over an extended battlefield framework.
- Conduct defend or delay operations.
- Rapidly transition to changes in focus and mission, between tactical engagements or battles. Rapidly accept augmentation forces and establish strengthened relationships, supporting to supported.
- Build and sustain combat power of organic forces.
- Execute a company-sized tactical air assault. Execute a battalion- sized air assault with divisional UE support.
- Execute Stability Operations.
- Execute Support Operations

[23] Ibid., 41.

Surveillance (R&S) and develop the situation. This combination should also be employed to engage and destroy the most dangerous and the high payoff target sets. The authors also believe this combination of assets viable to provide close support to ground maneuver forces.[24] As the scenario unfolded and the computer simulations were conducted, these tenants were largely followed.

The Scenario

The initial scenario would test all of the qualities of firsts in an early entry operation as U.S. Army officers at the Army War College employed the UA using the O&O as their guide.[25] The backdrop for the exercise was set in current day Kazakhstan, against a fictional force in the year 2012. The force was comprised of six divisions, two mechanized and four armored, with an estimated seventy-five surface-to-surface missile TEL systems with a range of 1800+ kilometers. In addition, they had five air divisions equipped with MIG and Euro-fighter-like aircraft, helicopters, and UAVs.[26]

The enemy objectives were to seize control of the oil fields in the Caspian Basin belonging to one of our allies, giving them complete control of the oil pipelines. In addition, they wanted to capture Astana (the capital city) and neutralize nuclear weapons based throughout the country. They also wished to eliminate what they viewed as a bourgeoning threat from the Islamic extremism within the country.

As enemy and allied forces mobilized and tensions in the region rose to a pitched war of rhetoric, all intelligence sources indicated that an invasion was eminent. Faced with these facts, the President of the United States decided to deploy armed forces to the aid of our ally. The Combatant Commander directed the Joint Force Commander (JFC) to execute his approved

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[24] *Unit of Action O&O,* 159.

[25] Jeffery L. Shafer, "Future Combat Systems" (brief given to SAMS students participating in Boeing facilitated exercise, 17-22 September 2002).

contingency plan. The JFC's guidance established a three phase operation with the first phase focused on setting the conditions that would facilitate rapid introduction and build up of ground combat-power. The second phase involved projecting a balanced early-entry joint contingency force (within 96 hours of departure directly from their Continental United States [CONUS] bases) into the theater, and the third phase was the continued flow of combat forces into the theater. The Time-Phased Force and Deployment List (TPFDL) placed the Unit of Action (UA) at the tip of the spear for this deployment.

The UA conducted concurrent planning and had determined that there were five critical mission tasks for it to accomplish:

•Secure multiple C-130-capable airfields

•Establish a Covering Force to protect UA and UE initial entry for 48 hours

•Conduct a hasty defense to defeat the lead enemy Motorized Rifle Regiment along the main approach of approach no later than G+4 (G= the first day the unit is on the ground)

•Establish conditions for the UA to defeat any second lead enemy regiments no later than G+6

•Be prepared to attack/exploit retreating enemy forces no later than G+8

With these tasks established for the UA, the Aviation Detachment further defined its nested critical tasks as:

•Screen the movement of all RAH-66 Comanche and all ground UA formations to initial Battle Positions (BP) with UCAR

•Conduct reconnaissance of all mounted and dismounted avenues of approach with RAH-66 and UCAR

•Reinforce the ground reconnaissance company responsible for the forward screen with

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[26] Ibid.

RAH-66 and UCAR

–Must be able to maintain aerial Battle Positions for thirty minutes

•Maintain surveillance of Aircraft Landing Sites (for C-130s)

–Zone Reconnaissance

•Identify and attack enemy aviation and Non-Line Of Sight (NLOS) systems (artillery), and High Value Targets (HVT) / High Pay-off Targets (HPT) at greater than fifty kilometers from the forward positions of infantry and mounted combat system (105mm direct fire system) companies

•Detect movement of battalion-sized formations at 150 kilometers

–Identify at 100 kilometers

–Be Prepared To (BPT) attack and conduct target-handover followed by Battle Damage Assessment (BDA)

•Protect Battalion re-supply/re-armament/re-fuel operations

The UA deployed its forces as depicted in figure 2 in a battle space of 150 km by 75 km in order to meet the threat.

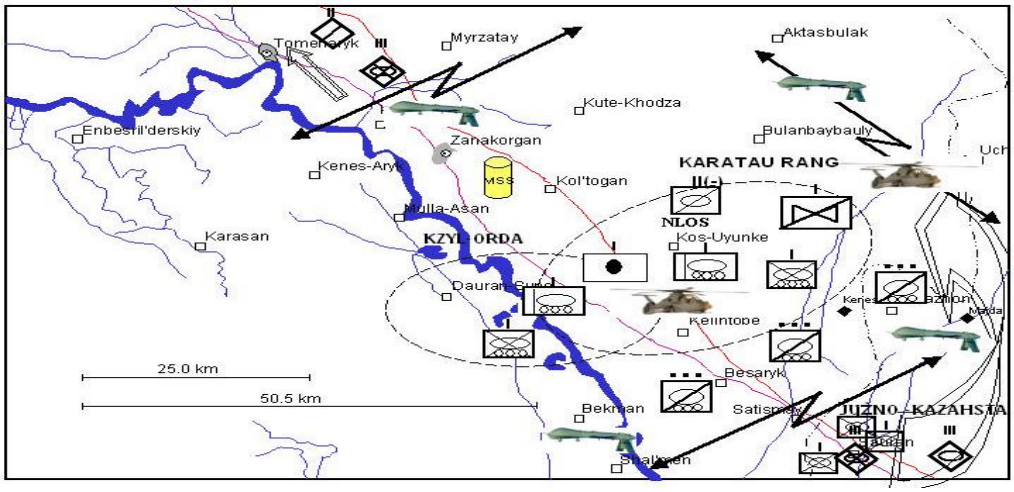


Figure 2: Initial force array for forced entry operations[27]

The Numbers

As the mission unfolded, the ATCOM / JCATS simulation compiled acquisition data for three categories: enemy verses friendly, acquisitions by type, and acquisitions by range. Data was also collected on engagements by type, engagements by range, and kills achieved by each weapon system.

The acquisition tables (figure 3) show that the Aviation Detachment acquired a total of 915 targets while all of the enemy acquisition systems within their echelons acquired only 309 allied targets, a ratio of nearly 3.0. Figure 4 further delineates which systems within the Aviation Detachment were responsible for the acquisition of targets, and of those which could be classified, recognized or identified, either visually or by electronic means. Here "classified" is considered the lowest level of clarity; it simply means that the system is recognized as enemy or friendly. "Recognition" is one step up, with the system placed in a category such as armor, wheeled vehicle, air defense, etc. "Identified" is defined as specificity to the level of what type system it is, such as a T-72 tank, or a gun dish radar system. One important item to remember is that the fidelity of any acquisition data is not only a function of the inherent abilities of the sensors to detect, but also a reflection of the placement of that sensor in relation to the terrain and the enemy.

Within these categories, the UCAR was able to classify five, recognize ten, and identify four hundred and twenty-nine. The RAH-66 was able to classify seventeen, recognize nineteen, and identify three hundred and ninety-two. The ranges at which these tasks were conducted did not vary greatly. The RAH-66 was classifying objects at 7,000 meters while the UCAR was classifying objects as far out as 7,661 meters. The RAH-66 was actually able to recognize an object out to 7,282 meters and the best the UCAR did was 6,505. The ability for both systems to

[27] Jeffery L. Shafer, "Future Combat Systems-Wargame Summery" (brief given to SAMS students participating in Boeing facilitated exercise, 17-22 September 2002).

identify objects was nearly identical, with the RAH-66 identifying at 5,429 meters and the UCAR identifying at 5,400.

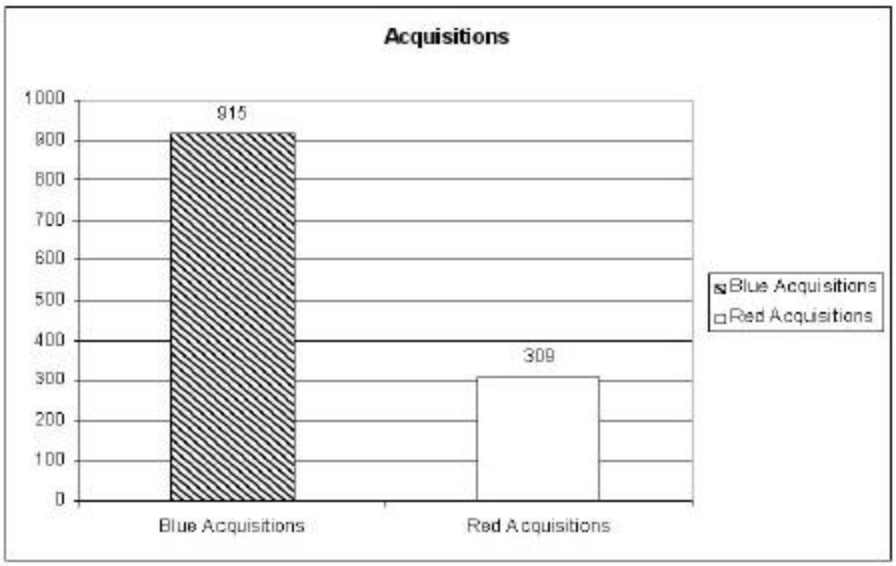
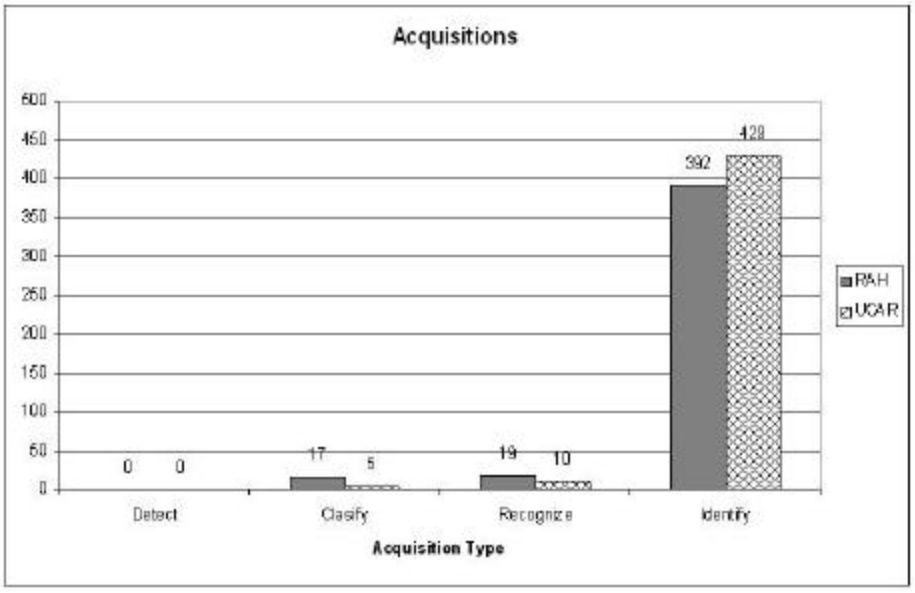


Figure 3: Acquisition by both red and blue forces[28]



[28] Jeffery L. Shafer, "Future Combat Systems-Wargame Summery".

Figure 4: Acquisitions by type - enemy[29]

An evaluation of the range at which the two platforms acquired targets revealed no substantial advantage to either system. The total number of acquisitions did, however, favor the unmanned system with the UCAR accumulating a total of sixty-three more target acquisitions than the Comanche. This advantage suggests that the smaller, more quiet, and therefore more difficult to detect UCAR could be extremely beneficial in the reconnaissance and target acquisition roles. More importantly, this data suggests a significant advantage for the Aviation Detachment in the "see first" arena. It provides The UA ground forces the time needed, and the ability to recognize what vehicles and forces are arrayed against them in order to potentially "understand first" what is transpiring on the battlefield.

In the simulation, the UCAR and Comanche were also linked to a fires net and able to call for fire from other friendly systems. This increased their ability to engage targets well beyond the range of their organic weapons systems. The engagement by system data (figure 5) as well as the engagement by range data (figure 6) when combined with the number of red systems killed (figure 7) are helpful in defining mission success in the "finish decisively" arena.

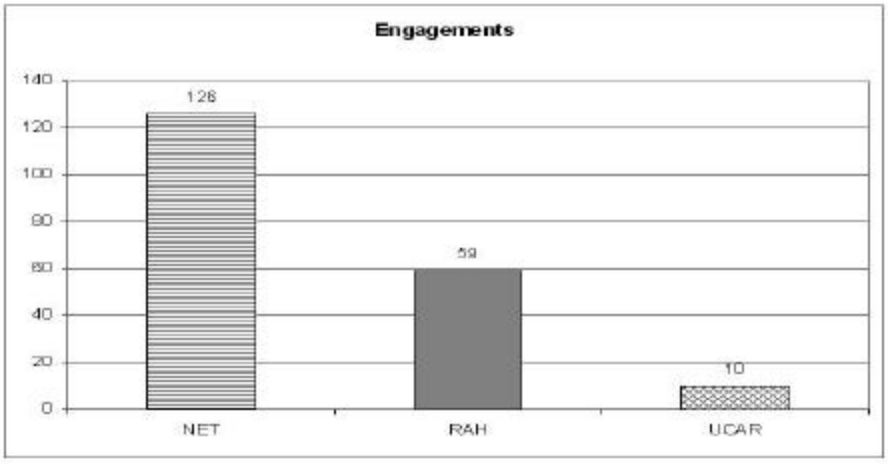


Figure 5: Blue engagements by systems[30]

[29] Jeffery L. Shafer, "Future Combat Systems-Wargame Summery".

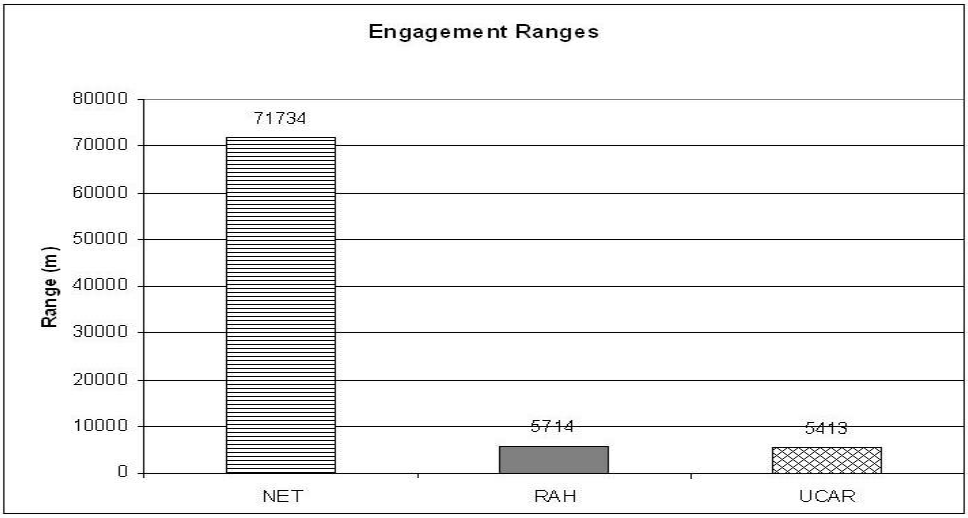


Figure 6: Blue engagements by range[31]

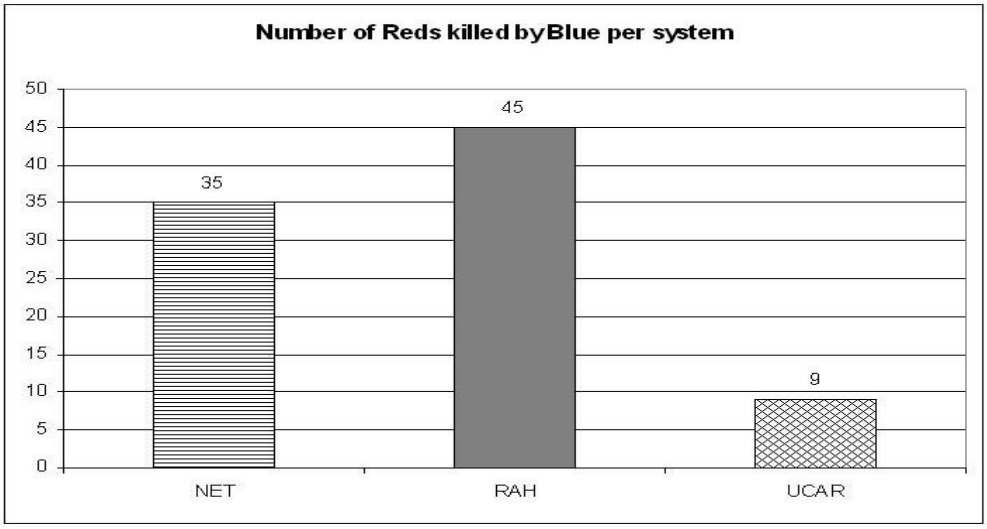


Figure 7: Number of red systems killed by blue systems[32]

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[30] Jeffery L. Shafer, "Future Combat Systems Wargame Summery".

[31] Ibid.

[32] Ibid.

The RAH-66 had fifty-nine direct fire engagements at a maximum range of 5,714 meters. Of those fifty-nine direct fire engagements, forty-five were deemed kills. The UCAR had ten direct fire engagements at a maximum range of 5,413 meters. Of those ten direct fire engagements nine were deemed kills. Between the RAH-66 and the UCAR, 126 indirect fire missions were called for with the maximum range of the longest shot measuring 71,734 meters from the shooter to the target. Of these 126 indirect fire engagements, thirty-five were classified as kills.

Summary

This fight did point out some key tactics techniques and procedures (TTP) for employing the Aviation Detachment in future early entry operations. First, the early employment of the RAH-66 and UCAR to establish a screen line of Observation Posts (OP) two to three hours ahead of the ground forces helped the ground forces quickly transition from the march into its covering force positions. To help this operation run smoother, NLOS (artillery) and ADA assets need to be pushed forward in the line of march to engage threats detected by the Aviation Detachment, primarily by the UCAR. On several occasions UCAR identified HPTs and HVTs, but the lack of NLOS or ADA assets in those columns, mandated that the RAH-66 be employed to engage the targets from a holding area, a slower more resource-intensive technique.[33] Another lesson learned from this simulation is that in order to execute this TTP it is imperative to front-load the UCARs in the airflow.

The employment of the UCAR, especially in the counter reconnaissance fight, must be balanced between the need to position the vehicles in survivable OPs and the need to risk exposing the UCAR to fire in order to detect enemy air and ground elements. Initial OPs for the UCAR were extremely survivable, but the terrain on which they were located and the altitude at which the vehicle was operating did not allow for adequate detection of enemy UAVs and

helicopters. Subsequently, initial penetration of the screen line by enemy UAVs resulted in detection and engagement of friendly forces. Similarly, RAH-66 and UCAR OPs must allow for the detection of enemy elements at a distance that provides sufficient time and space for friendly forces to maneuver to a position of advantage for LOS and NLOS engagements.

As the scenario progressed, and the UCARs were finally positioned well in advance of the main body, and in some cases well in advance of the RAH-66 screen line, responsive UCAR target handover helped to optimize engagement ranges (up to seventy kilometers). This range for tactical targeting highlighted another salient point that had not initially been recognized in the initial employment planning. When operating in a battlespace of this size, 150 kilometers by 75 kilometers, with the Unit of Action performing covering force operations, a UCAR-type command and control relay capability could greatly enhance responsiveness of time sensitive targeting.[34]

As the operation drew to a close, the gathered data supported the conclusion that the Aviation Detachment was able to accomplish its critical mission tasks. With the fusion of manned and unmanned aerial platforms, the detachment was able to see first, understand first, act first, and finish decisively. These qualities of firsts are the standards that the Aviation Detachment must attain to meet the statement of required capabilities put forth in the O&O.[35]

The data from ATCOM / JCATS suggest that in the reconnaissance and security mission, the fusion of the Comanche and the UCAR is the optimum TTP. Historically, the cornerstone for reconnaissance and security missions is to see the enemy first, a paradigm that the Unit of Action is readily embracing. As far back as Vietnam, the requirement for Army rotary wing aircraft to "see first" was recognized and led to the successful tactic of employing two scout helicopters to detect the enemy, while one gunship provided overwatch, a TTP commonly known in aviation

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[33] Jeffery L. Shafer, "Future Combat Systems Wargame Summery".
[34] Jeffery L. Shafer, "Future Combat Systems Wargame Summery".

parlance as a two-one mix. Once the enemy is detected, the scouts have the option of calling in their gunship or calling for artillery or close air support. The advent of the Comanche and the UCAR, as well as a whole host of new fire systems, once again makes the two-one mix an extremely feasible TTP. The ability of one Comanche crew to pilot more than one UCAR to facilitate a two-one mix is, however, doubtful. This would imply that in order to take advantage of teaming multiple unmanned systems as scouts, one UCAR could be controlled by the Comanche aircrew while the other would have to be controlled by a ground station. This would provide a viable two-one mix that would maximize the fusion of these two platforms for the Unit of Action.

[35] *Unit of Action O&O,* 139.

Chapter 3

SURVIVABILITY

The survivability of any force on the battlefield is paramount, but for the Objective Force Unit of Action it is even more imperative for one salient reason: time. As previously discussed, the Unit of Action can be expected to perform "as is" across the full spectrum of combat operations for anywhere from three to seven days, dependant upon where in that spectrum they are conducting their operations. To a commander, this translates into the reality that there will be no influx of personnel or equipment during this three to seven day window. In such an operation, every asset the commander has becomes a "pacing item."[36] With resources constrained in a combat environment, the loss of a single weapon system or resupply vehicle could result in potentially catastrophic repercussions.

Because of this "as is" mandate for the Unit of Action, the tenet of survivability is meticulously measured against nearly every aspect of the organization. The Unit of Action concept endeavors to take advantage of all current and developing technologies in order to provide the soldier with the maximum battlefield survivability, whether they are on or off the platform from which they will be fighting. To accomplish this level of survivability, the Army intends to fuse the optimum combinations of low observability technology with a myriad of active and passive systems.[37] Pivotal among these survivability enhancing systems are those that facilitate information superiority. With the potential ability to collect and disseminate information that provides the location of friendly and enemy systems, the UA will have a marked advantage over their adversaries. Combine and overlay this information on an updated realistic interpretation of the surrounding terrain and the Unit of Action forces have the potential to

[36] A pacing Item is a logistics term that refers to an item essential for a unit to conduct its war time mission

[37] *Unit of Action O&O,* 51.

increase their survivability exponentially. This information provides friendly forces tools to better comprehend and use the terrain to their advantage for cover, concealment and mobility. Having this information is only the first step in using information to enhance survivability; the ability to act or react quickly on this information is also an imperative to survival on the battlefield. To this end, it has been mandated that the Unit of Action vehicles will have superior dash speed than do today's combat vehicles, primarily to move from cover to cover.[38]

The dispersion of units, while still maintaining mutual support and overwatch, has long been recognized as an asset in assuring survivability on the battlefield, and the Unit of Action has expounded upon this concept by developing units that are fully networked. This networking provides units the ability to disperse while still maintaining "digital overwatch." This overwatch not only occurs at the traditional horizontal unit level, but can now occur vertically at multiple echelons, to include assets outside the organic unit.

Having weapons systems that are more lethal than the opponent's is also a time-proven method for augmenting battlefield survivability, and the Unit of Action has striven to make sure this advantage remains distinct. To accomplish this, the focus has been placed on developing technologically advanced primary weapons systems that provide a first-round kill capability. This focus on lethality has also expanded to encompass additional systems that provide extremely effective suppressive and obscuration fires that can be utilized when the Unit of Action is required to close with and assault the enemy.[39]

All of these concepts for survivability, as stated in the methodology section of this paper, are addressed in the O&O. From these concepts, five criteria are set forth that define what are considered to be the desired characteristics for achieving the optimal degree of survivability. These five criteria can be broken down into two groups. The first group can be classified as

[38] *Unit of Action O&O*, 43.

[39] Ibid., 29.

passive criteria measures: low observability and ballistic protection. While the Aviation and Troop Command / Joint Combat And Tactical Simulation (ATCOM / JCATS) model does not directly replicate ballistic protection, some correlation can be drawn between aircraft lost as a result of ground fire and their ballistic tolerance. The second group can be classified as active criteria measures: long-range acquisition and targeting, early attack, and first-round hit-and-kill. In examining the Aviation Detachment's construct and capabilities, all of these criteria can be found, and evaluated to some extent.

Passive Criteria

Possibly the most significant of the five survivability criteria, as applied to the aircraft, is the low observability or stealth capability they incorporate. Central to the Comanche's survivability is the aircraft's ability to see the enemy first without compromising its own position. Few if any of the mission tasks this aircraft is required to conduct can be accomplished if this first criteria is not met. As discussed in chapter one, the Comanche has an incredibly small radar cross-section (RCS) making its acquisition by enemy radar exponentially difficult. The reduction of the Infrared (IR) signature by seventy-five percent contributes substantially to its low observability.[40] This means that even if the aircraft is detected optically, the ability for an IR missile to lock on to the Comanche is incredibly low. The reduction of rotor noise by half, compared to that of today's aircraft, is not per se low observation, but this attribute will reduce the time ground troops have to react to aural cues and engage the aircraft with small arms. Ground fire from enemy small arms has traditionally been the major killer of rotorcraft at the Army's Combat Training Centers.[41] All of these aspects let the Comanche get dramatically closer to the enemy, if need be, while drastically lowering the probability of being observed. This

[40] Federation of American Scientists, "RAH-66 Comanche Systems", [Online], Available at http://www.fas.org/man/dod-101/sys/ac/rah-66.htm. Accessed December 15, 2002.

[41] Joint Readiness Training Center After Action Review for the 2/82nd BCT Rotation 01-02, November 2000.

capability allows the Comanche to "see first," thus contributing directly to the aircraft's ability to survive on the battlefield.

If the aircraft is detected, the designers ensured that the crew would have the ability to maneuver out of harm's way with a dash speed in excess of 170 knots. If engaged, most of the systems are redundant, reducing the chance for one shot to destroy a key system, and the helicopter's airframe is ballistically tolerant to 23 millimeter gunfire, with the rear rotor able to withstand impact by 12.7 millimeter rounds.[42] If the aircraft does receive a fatal blow, the resilient airframe design provides superior survivability for the crew in a crash sequence.

Active Criteria

The desired criteria for long-range acquisition and targeting, as well as early attack, are some of the central concepts upon which the Comanche was developed. As mentioned in the initial information about the Comanche systems, the networked fires that the aircraft can employ cover the entire gambit. This means that via digital overwatch, the Comanche can request fires from any echelon from a team on the ground to theater level assets, if they are in the network. Likewise, all those echelons may request overwatch fires from the Aviation Detachment assets. The onboard sensors and systems on the Comanche and UCAR also promulgate the intelligence organs of the Unit of Action, providing data that contributes directly to the fusion of battlefield systems which is the basis for information superiority. The Aviation Detachment can accomplish this at twice the range of the current aerial platforms in the Army's inventory.[43]

As a survivability criteria, the ability to achieve a first shot kill is approaching reality as improvements in weapons targeting and precision guidance continue to be refined. While the Comanche's 20-millimeter nose mounted gun is not a new weapons system, the updated ballistics

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[42]Army Technology.Com, *RAH-66 Comanche Reconnaissance / Attack Helicopter –USA*, [Online], Available at http://www.army-technology.com/projects/comanche/. Accessed December 16, 2002.

computers make it an extremely accurate system. Additionally, the 70-milimeter folding fin aerial rockets that are employed by the aircraft are undergoing a modernization of their own. A new series of rockets with laser guidance systems embedded in the warhead is currently being tested for use with the RAH-66. This will turn what is currently an area-fire weapons system into a precision guided munition. The main weapon system of the aircraft is the millimeter wave Hellfire missile. This system is the first true anti-armor fire and forget weapon employed on Army helicopters, and is generations beyond the basic Hellfire missiles used so effectively in the 1990 Gulf War.

Many of the survivability traits of the RAH-66, such as being a low observable platform with advanced systems for detection and engagement of targets, will also be incorporated in the production of the UCAR. But more importantly, the UCAR itself is a survivability asset for the RAH-66. With the ability to link into the UCAR's systems, the pilots in the Comanche can use it to extend their standoff distance from the threat. The visual and electro-optical data from the UCAR can be viewed in the cockpit of the Comanche, as the smaller, more difficult to acquire UCAR acts as the initial scout, clearing the way in front of the manned aircraft. In this instance, if the UCAR identifies a target, the pilots can use the data to launch munitions against that target without exposing the Comanche to the identified threat. In fact, the munitions that the pilot directs on to the target can come from his aircraft, from the UCAR, or from any other system he has access to in the fires network.

Employment of the UCAR independently can also contribute to the survivability of the Aviation Detachment. First, in an extremely high risk mission profile, created by either the adversary or environmental conditions, the UCAR can be employed with a somewhat reduced capability of engaging targets with organic fires, but still have access to the same networked external fires the Comanche would use. Additionally, the UCAR can be employed by itself, in a

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[43] Federation of American Scientists, *RAH-66 Comanche Systems*, [Online], Available at

rotational pattern with Comanches, to extend the amount of time the Aviation Detachment can provide aerial assets to the Unit of Action Commander.

Summary

In the Caspian Basin early entry scenario, the UCAR was initially employed without the Comanches, and then later in conjunction with the RAH-66. From this particular operation, several aspects of the survival criteria were captured in several different sets of data. Much of this data was previously used to help evaluate mission success criteria, but is equally applicable in accessing survivability. Under the passive criteria measure of low observability and the active criteria of long-range acquisition, the Aviation detachment's UCARs were extremely successful in avoiding detection by the enemy (zero) while detecting substantial numbers (444) of the opposing force's vehicles at an average range of 6,522 meters (Appendix A, figure 9). The Comanches, to a somewhat lesser extent, also achieved notable success by detecting a great many (428) enemy vehicles at an average range of 6,570 meters (Appendix A, figure 9). They were not, however, nearly as successful at going undetected by the opposing forces, and lost five aircraft to enemy fire. Under the active criteria of first-round kill, both aircraft performed well, with the UCAR delivering an exceptional nine of ten hits, for a ninety percent probability of kill. The Comanches achieved a somewhat lower probability of kill ratio of seventy-six percent first-round kills by destroying forty-five of fifty-nine targets engaged.[44] The data collected also included information engagements by the Comanche and UCAR via network fires. These results were considerably lower, with a kill rate of twenty-eight percent.[45] One caveat needs to be addressed concerning this final set of statistics on network fires. While the Caspian Basin scenario was a future-based situation, and the non-line of sight and beyond line of sight systems

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http://www.fas.org/man/dod-101/sys/ac/rah-66.htm. Accessed December 15, 2002

[44] Jeffery L. Shafer," Future Combat Systems-Wargame Summery".

[45] Ibid.

were part of the model, most of the systems were still optimized as suppression-type weapons, not first-round kill systems. The O&O depicts the Unit of Action as being populated by future systems with a much higher probability of kill, which, when employed by the Comanche and UCAR, will greatly enhance the early attack aspect of the active criteria.

As per the O&O, the RAH-66 Comanche and UCAR incorporated the criteria set forth for survivability, to varying degrees as described above. But as the United States Air Force demonstrated in 1999 during Operation Allied Force, advanced systems and stealth technology do contribute greatly to an aircraft's survivability, but they do not insure it. During this air campaign over Kosovo, the Air Force suffered the first combat loss of an F-117 stealth fighter.[46] One aspect the O&O does not address in the survivability criteria is the percentage of systems a commander may expect to lose in combat. Since those numbers are nonexistent, this study will incorporate the currently published standards for expected losses in an attempt to extrapolate how the Aviation Detachment would perform by current norms. Current planning figures project that for a similar type of operation today, a commander should expect fifty-five percent losses.[47] In this situation, the Detachment traded five RAH-66 Comanche aircraft lost, about forty-two percent, for an enemy BDA of eighty-nine combat vehicles destroyed (Appendix A, Figure 8), still markedly better than the predicted loss rate. Nearly all of these aircraft losses occurred when the Comanches were employed without the UCAR's support. To reiterate an earlier point, the UCARs themselves proved exceedingly survivable when deployed alone, registering no combat losses at all.

Several issues gravitate to the forefront after reviewing the results of the ATCOM / JCATS modeling. First, it appears that the UCARs provided the Comanches considerably more

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[46] Report to Congress, *Kosovo/Operation Allied Force After-Action Report*, January 31, 2000. 79. During Operation Allied Force the Air Force flew 38,000 sorties and only lost two aircraft.

[47] U.S. Army, *Student Text 101-6: Combat Service Support Battle Book*(Fort Leavenworth KS: July 2001), 4-7.

security, thus survivability, when they were working in tandem. It is probable that this was due to the UCAR's ability to acquire more targets at a better standoff range than the RAH-66. Secondly, while the UCAR did have a higher rate of first shot kills, the Comanche killed more targets in total. This is probably attributed to the fact that the Comanche is capable of carrying a much larger weapons payload. None the less, these two observations linked together lead to two possible Tactics, Techniques, and Procedures (TTP). Foremost of these TTPs is that for attack missions or security missions, both of which rely on a measure of firepower, the optimal mission configuration may be the pairing of the two systems. However, in a purely reconnaissance or surveillance mission, the low detectability of the UCAR may make it the platform of choice, solely on a survivability basis. Finally, the relatively ineffective use of networked fires in this scenario must be tempered with the fact that there were few precision munitions used and, as is now the case, it is extremely difficult to register a "kill" with indirect fire systems.

In this early entry operation, the raw numbers of enemy vehicles destroyed by the Aviation Detachment was significant. The mission was successfully accomplished as defined by the operational commander, and the conditions for the next phase of the operation were set. By accomplishing this critical requirement and addressing all the stated criteria, the Aviation Detachment as a whole can be considered survivable. Mirroring the recommendation in the chapter concerning operational performance, the optimum mix of UCARs and Comanches from a survivability standpoint is most likely a two-one mix. The fact that two unmanned, more difficult to detect platforms precede the manned vehicle, exponentially increase the survivability of the Comanches by providing a real-time image of the terrain and any possible threats that reside therein. One qualification needs to be applied to this judgment as pertaining to this scenario. If for operational reasons the Aviation Detachment was required to transition to the next phase of the operation, above and beyond the doctrinally prescribed seventy-two hours of high intensity

operations, the loss of nearly half the Comanches would severely restrict the detachment's capabilities.

Chapter 4

SUSTAINABILITY

With deployability being one of the corner stones of the Objective Force, the question arises as to what impact this will have on the sustainability of the Unit of Action. The flexibility desired for the Objective Force has driven the requirement that everything comprising the Objective Force Unit of Action be deployable by C-130 transport aircraft.[48] With this flexibility comes a certain trade-off in capability, in the case of the Unit of Action, the cost is a reduced Combat Support (CS) and Combat Service Support (CSS) capability.

This detriment in capability is theoretically compensated for by the doctrinal guidelines that state the Unit of Action is only expected to fight for seventy-two hours without any external assistance (in the high intensity end of the full spectrum of operations). The Kazakhstan scenario was a high intensity conflict and lasted just under seventy-two hours. To understand how the Aviation detachment managed to sustain itself for nearly three days, it is important to understand the CS / CSS structure and concept within the Unit of Action. This structure is designed to be totally self-sustaining for seventy-two hours, if that demand is placed upon it.

The ATCOM / JCATS model does not have a logistics interface as such, but based on the mission profile, the size of the area of operations, derived fuel consumption rates, and the engagement data that related to ammunition expenditure, some qualified extrapolations can be calculated. In order to direct the focus of this chapter, two of the most difficult aspects of sustaining the Aviation Detachment will be examined, fuel (class III), and ammunition (class V), with some attention devoted to the maintenance aspect of sustainment. Within the Unit of Action, there are two resident levels of sustainment for the detachment, the Forward Support Battalion and the Aviation Service Troop.

The Aviation Service Troop

The first level, or echelon, within the Unit of Action that is responsible for providing support to the Aviation Detachment comes from the detachment itself in the form of the Aviation Service Troop. The troop combines the maintenance and support functions currently accomplished in an aviation squadron / battalion by the Aviation Unit Maintenance (AVUM) troop / company and the Headquarters and Headquarters Troop / Company (HHT / HHC). At a total of fifty-nine personnel, the Aviation Service Troop is significantly smaller than the collective two hundred plus that currently comprise the AVUM and HHT.

The maintenance functions of the Support Troop are accomplished by the maintenance platoon, which consists of three separate squad-sized elements. These include an Armament and Electronic repair section, an Aircraft Repair Section and an Airframe Repair Section. The entire platoon is comprised of twenty-four solders; this number will become important latter when the study examines how the detachment may decide to conduct twenty-four hour operations from dispersed locations on a non-contiguous battlefield.[49]

Within the Support Troop, the design for the Aviation Support Platoon reflects similar numbers to that of the maintenance platoon with a total of twenty-two personnel assigned. The services this platoon provides are limited to petroleum (POL) and ammunition. To conduct their mission, the platoon has a total of two vehicles which can transport ammunition and four vehicles in which they can transport POL.[50] Once again, these numbers, and the resultant battlefield capabilities / requirements will be an issue of some importance in the discussion of dispersed sustainment operations over an extended time frame.

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[48] U.S. Army Training and Doctrine Command Pamphlet 525-3-90/O&O, *The United States Army Objective Force Operational and Organizational Plan for Maneuver Unit of Action,* July 22, 2002. G-1.

[49] *Unit of Action O&O Change 1,* 3-50.

[50] Ibid., 3-31.

How will these elements of the Aviation Support Troop conduct its mission to sustain the two aircraft troops during combat operations? The O & O dictates that the Aviation Support Troop will be able to provide all the unit-level maintenance (AVUM), to include Battlefield Damage Assessment and Repair (BDAR) for the Comanches and UCARs, as well as any necessary maneuver sustainment required to function autonomously throughout the Unit of Action battle space.[51] The operational requirements further refine these dictates to include the capability to establish a four point Forward Arming and Refueling Point (FARP), which can be broken down to establish two separate (but smaller) FARPs. Each of these FARPs is expected to provide maintenance and armament support, combined with rearming and refueling in order to support continuous operations. The resident transport capabilities within the service troop are designed to provide it with the organic assets required to store and convey one day's fuel supply and basic load of ammunition across its area of operations. Any additional sustainment of supplies or maintenance augmentation is designed to be provided by the Forward Support Battalion (FSB).[52]

The Unit of Action Forward Support Battalion

The second level of sustainment for the Aviation Detachment, and the primary provider of sustainment on the Unit of Action on the battlefield, is the Forward Support Battalion. The battalion is comprised of the headquarters and three companies: the Headquarters and Headquarters Company (HHC), the Sustainment Company, and the Medical Company. The FSB carries the balance of the brigade's three days of logistics requirements for high OPTEMPO and/or seven days of requirements for low OPTEMPO. Overall, this battalion is responsible for providing limited sustainment, field maintenance and recovery, and medical support to all of forces in the Unit of Action brigade. Its charter squarely designates it as the entity responsible for

[51] *Unit of Action O&O Change 1*, 3-32.

[52] Ibid., 3-33.

planning and coordinating the Unit of Action's sustainment requirements, as well as executing replenishment operations in concert with the operational plan and Unit of Employment resources.[53]

In order to visualize how the sustainment of the Aviation Detachment is accomplished, it is beneficial to understand the composition and responsibilities of the organizations that are tasked to conduct that mission. The Sustainment Company's mission is to distribute supplies, conduct field maintenance and recovery, exchange UAVs, and provide limited field maintenance and evacuation of all the UAVs in the Unit of Action. It is, however, important to note that the Sustainment Company does not recover UAVs from the battlefield. To facilitate this monumental mission, the company has two platoons that are responsible for different aspects of the sustainment mission: a distribution platoon and a maintenance platoon.

The distribution platoon consists of two sections, eachwith thirty-seven Future Tactical Truck System-Maneuver Sustainment (FTTS-MS) each and a UAV exchange section. The FTTS-MS is the logistics equivalent of the Future Combat System (FCS), a yet to be defined multi-functional, multi-proponent single tactical truck family based upon a common chassis design.[54] It will transport every class of supply, and variants will also be organic to the units within the Unit of Action. This FTTS-MS is the primary means within the UA by which supplies are transported and distributed to all its subordinate elements.[55]

The distribution platoon is also where the balance of the Unit of Action's three days of supplies required for high OPTEMPO reside, minus those carried by the FCS platforms and the maneuver unit organic trucks. The distribution platoon executes all the Sustainment Replenishment Operations in support of the UA, which includes three combined arms battalions,

[53] *Unit of Action O&O Change 1,* 3-34.

[54] Ibid., 3-49.

[55] Ibid., 3-46.

a NLOS battalion, an Intelligence Company, as well as the Aviation Detachment. And although it was not within the scope of the operation in this study, when it is required to, the distribution platoon accepts augmentation from the Unit of Employment maneuver sustainment elements to assist it in conducting sustainment replenishment operations.

The Maintenance Platoon is the other sustaining asset the FSB provides to the Unit of Action. It functions by providing Combat Repair Teams (CRTs) to all the battalions (two teams supporting each CA Battalion; two teams supporting the NLOS Battalion; and two teams providing area support to the Unit of Action HQs, the BIC Company, and the Aviation Detachment ground assets). These CRTs are strictly ground maintenance assets and provide no aircraft maintenance. It is important to point out that there is no Direct Support (DS) level maintenance in the Unit of Action for the Aviation Detachment's Aircraft. This implies that the maintainers in the Aviation Service Troop will conduct what are currently considered DS maintenance tasks. The CRTs in the maintenance platoon, however, are critical to insuring the Detachment's limited ground support assets are functioning and able to support the aviation mission. These CRTs will perform field maintenance requirements beyond the capability of the crew chief/operator. They will also accomplish BDAR, limited recovery operations, and all field maintenance tasks where capabilities not organic to the crew are necessary to complete the repairs.[56] The immediate maintenance support focus for these CRTs within the Unit of Action will be those limited maintenance functions required to keep systems in the fight until completion of the current operation or until such time as the battle rhythm allows for more in-depth maintenance. As with many other aspects of the Unit of Action, the ability of these CRTs to be effective is caveated by the fact that there must be substantial technological improvements inthe current systems that will allow the implementation of the Army two-level maintenance system.

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[56] *Unit of Action O&O Change 1,* 3-49.

This two-level system is in essence a split in maintenance functions that dictates repairs are either done at unit level or are sent directly to a depot repair facility.[57] The corner stones for these technological advances encompass increased system maintainability and reliability, an integrated common operating picture, plug and play component design, and programmed logistics enablers that include Integrated Electronic Technical Manuals (IETM) and embedded diagnostics and prognostics.[58]

The Numbers

In the Caspian Basin scenario, the Aviation Detachment was operating as a component of an un-augmented Unit of Action, in relation to its sustainment requirements and capabilities. With the dimensions of Area of Operations covering approximately fifty by seventy-five kilometers, the Aviation Detachment was operating well within its expected range.[59] The early entry operations situation also interjected the Unit of Action in a more linear, contiguous-type of combat environment. As such, the Aviation detachment could plan on operating on interior lines and had a relatively definable front line. With this information in hand, the detachment positioned two FARPs the doctrinal eighteen to twenty-four kilometers away from the boundaries they would be initially screening.[60] As per the O&O there would be an entire rearm, refuel, and maintenance package at each site with one day's worth of basic load on hand. This would be a total of three FTTS-MS fuel tanker variants and about twenty-seven maintenance personnel at each FARP, leaving no fuel or maintenance capability at the aviation assembly area.

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[57] Major General Mitchell H. Stevenson, "Army Maintenance Transformation," *Army Logistician* 34, no. 5 *(2002): 6-9.*

[58] *Unit of Action O&O Change 1*, 3-50.

[59] *Ibid.*, 4-6. The 22 November 2002 O&O prescribes that the UA area of operations will always equal the area of influence for the UA. In chapter 4.3.4 the guideline for the brigade area of influence is a 75km.

[60] US Army Field Manual 1-111, *Aviation Brigades* (Washington, DC: Government Printing Office, 27 October 1997), J-7.

Each of the six aircraft can carry a total of fourteen Hellfire missiles, the primary weapons system, in the attack configuration with the addition of stub wings. But in this scenario, the Comanche was in a reconnaissance configuration which means it was carrying six Hellfires in its internal weapons bay. To the sustainers, this translates to a requirement for each FARP to have seventy-two Hellfire available (two turns through the FARP for each aircraft). With a total of sixty-nine engagements by the Aviation Detachment (fifty-nine by Comanches and ten by the UCAR), a concern over the depletion of the initial basic load of Class V did not materialize.

The potential for the depletion of Class III (fuel) was also carefully examined to determine if this traditional "center of gravity" of sustainment would present itself as an issue. The current requirements document for the FTTS-MS fuel tanker does not specify fuel capacity, but rather it describes a short ton capacity of thirteen tons.[61] If this is interpreted as strictly cargo weight, it equates to 3880 gallons of JP8 fuel per vehicle. With three FTTS-MS vehicles per FARP, one is dedicated to carrying ammunition and two are tasked for transporting fuel, which means there can be no more than 7760 gallons of JP8 available at any given time, without augmentation.

As is currently done, some "battlefield calculus" is accomplished to determine sustainment requirements based on the mission. Understanding that mitigating factors will influence the flight time throughout the operation, a base line is nevertheless established for planning. Each troop was responsible for providing continuous coverage of their geographically separate areas for seventy-two hours. Once again for planning purposes, each troop of six Comanches and four UCARs was divided into three teams of manned aircraft enhanced by a single UCAR, with the remaining UCAR in reserve. Each team was then given the responsibility for one eight-hour block within every twenty-four hour period. Within that block, coverage could

[61] United States Army Combined Arms Support Command, *Future Tactical Truck System – Maneuver Sustainment Vehicle FTTS-MSV Emerging Desired Capabilities*, [Online], Available at.

be conducted with any combination of aircraft, but for planning purposes, each aircraft would be flying six hours a day. This six hour a day flight capability was based principally on availability statistics produced by the TSM Comanche office.[62] A detailed breakdown of how these flight hour numbers were arrived at can be seen in annex B. With a consumption rate of 166 gallons per hour of flight time, each troop of six Comanches daily consumption would be 5976 gallons of the available 7700 gallons of JP8.[63] From these initial planning figures, it is glaringly obvious that there should be no lack of fuel for the detachment, even with the inclusion of the UCAR fuel requirement. This means that the Class III logistics were not a limiting factor for providing continuous coverage.

What did emerge as a limiting factor was the aircraft availability statistics. As reflected in annex B, the Comanche is apportioned six hours of flight time, three two hour intervals, in a twenty-four hour period. The primary driver of this limitation appears to be a function of required maintenance. The restriction this placed on the Aviation detachment was that within each eight hour block, there would be no way to have two Comanches airborne continuously. Some combination of Comanche and UCAR would have to be utilized to account for a two hour gap the Comanches alone could not cover. A possible solution is to utilize a combination of a two-one mix, interspersed with one hour blocks covered exclusively by a team of UCARs. Figure 8 shows an alpha and bravo team of Comanche and UCAR split into an eight hour time block rotation. Within every four hour block, there is one hour dedicated to a UCAR pure team. This arrangement offers two advantages. The first is that the initial and final coverage period will have a Comanche in the air to conduct a battle handover with the next team. The second benefit

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httpwww.cascom.army.miltransportationFTTS%20publicIndustry%20Day%20EDC%20fp.pdf . Accessed March 09, 2003.

[62] Master Sergeant Joseph Hughes [Assistant TSM Comanche], interviewed by author, e-mail, Fort Rucker, Al., 9 March 2003.

derived from this method of deployment is that there is an hour break for the pilots in the Comanche in the middle of their rotation to conduct any needed maintenance or simply to take a short breather. The mixing and massing of the Aviation Detachment's assets will of course be driven by the timeless military axiom, everything is situational dependent, but this two-one mix offers a flexible template as a point of departure for the commander. It should be noted that two assumptions figure prominently in this equation. The first is that during the initial twenty-four hours of operations, all six aircraft and four UAVs remain operational or are quickly returned to that status by the detachment personnel. The second assumption is that the UCAR's fuel consumption rate is significantly lower than that of the Comanche and will not exceed the current surplus of fuel at the FARP. The true relevance of this battlefield calculus is that it reveals two planning imperatives. First, a careful balance must be struck between the utilization of manned and unmanned platforms in order to be able to sustain continuous operations for the first twenty-four hours without a lapse in ISR capabilities. And lastly, without detailed planning and coordination with the FSB for pulse sustainment, the Aviation Detachment may not be able to sustain itself for more than twenty-four hours of continuous operations.

On last hurtle to consider in the sustainment aspect of the Aviation Detachment is actually a third order effect that must be addressed by a change of intuitional bias. Imagine if an infantry man was told that a robotic Ranger buddy was going to provide his suppressive fire as he rushed the objective; he may display some small amount of angst. The same reaction can be expected from many pilots when they are told their wingman is going to be an armed UAV. However, as described earlier, this Tactic Technique and Procedure will have to be adopted in some form in order for the Unit of Action Aviation Detachment to provide the UA commander the ISR required, while still sustaining itself in a somewhat austere environment. Of course, an

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[63] *FM 1-111, Aviation Brigades*, J-41. Provides data that the OH-58D consumes 113 gallons of JP8 per hour and the AH-64 consumes 179 gallons per hour. The exact consumption rate of the Comanche is not available yet, but it should fall between these two aircraft.

enlightened view would suggest that the alternative combinations for the wingman concepthave now increased dramatically. The Comanche / UCAR wingman concept can either be employed to permit a manned asset to be available at nearly all times, or an alternating rotation can be

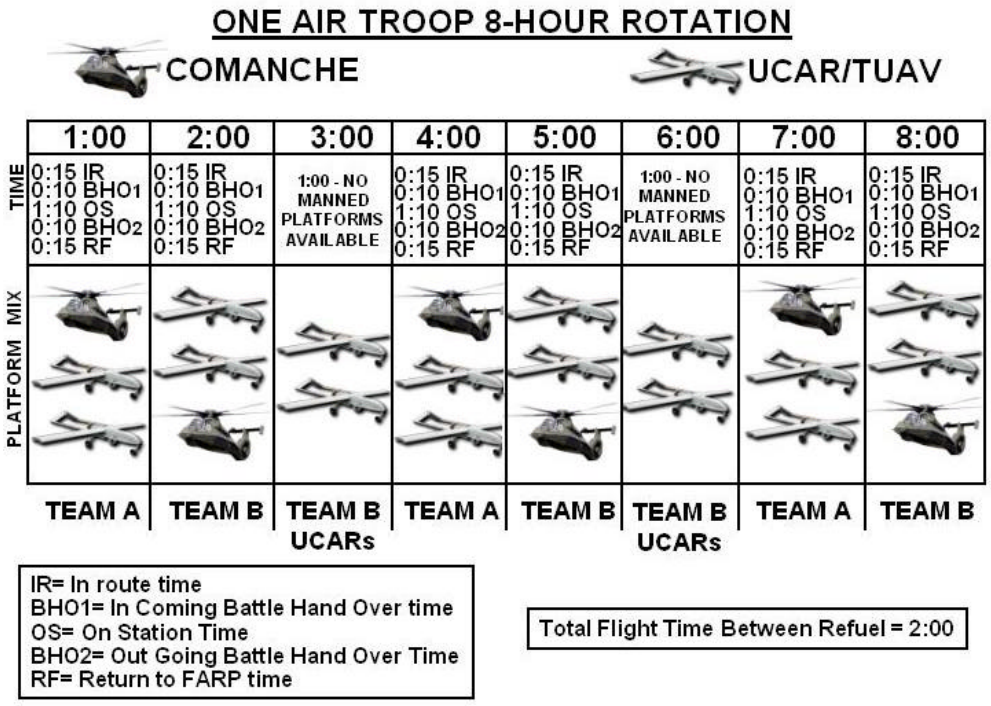

Figure 8: Proposed Comanche / UCAR employment

established of pure Comanches teams followed by pure UCAR teams. In fact, dependent on the situation and threat, one troop could employ one technique and the second troop could employ the other. Either TTP is viable, but from a sustainment viewpoint, the recommend building block for both is the mix of one Comanche and two UCARs. Whichever option is employed, this significant change in how aviation units fight must be addressed in order for the proposed sustainment structure to be effective. Any other option to sustain the Aviation detachment would

have to come in the form of increased efficiency from the aircraft or increased numbers of platforms in the detachment.

Summary

The raw numbers would suggest that the Aviation detachment could be sustained by the existing assets within the Unit of Action, but there are several doctrinal and institutional issues that need to be considered for this to be accomplished. For the Aviation Detachment's sustainment base, the FARPs, to be survivable, doctrine states they must displace every three to six hours.[64] With a relatively small contingent of personnel manning the FARP, and no depth of personnel in any one area, it will become extremely taxing on the soldiers as they conduct continuous operations for seventy-two hours. With a realistic refuel time for the aircraft of every two hours, the FARP can remain stationary for three refuel turns, six hours, and then relocate. This means the FARP will relocate a minimum of twelve times to new locations that the returning aircraft and the FSB must find. Admittedly, the projected improvements to the C4ISR structure should play a big role in assisting this process, but with just two hours in between fueling an aircraft, conducting a road movement, receiving resupply and establishing an operational FARP for incoming aircraft, synchronization and time management will be decisive.

Another aspect of the Aviation Detachment's ability to sustain itself is the issue of security. The FARP has historically been a high value target for the opposing forces. One answer to this security threat is the attempt to reduce the signature of the FARP by keeping it small and moving it frequently. Serious consideration must also be given to providing a small, mobile combat force, one or two vehicles, to provide the FARP with some legitimate security.

[64] *FM 1-111, Aviation Brigades*, J-7.

This is not only important during the actual refuel operations, but essential during the frequent road movements. The need for security during movement is further exacerbated by emerging doctrine that does not foresee continuously secure Main Supply Routes (MSRs), but portrays MSR security as a transient state to be evoked only for short periods of time when needed.[65] As alluded to earlier, the loss of any assets to include sustainment assets could have potentially irrecoverable reproductions during the first seventy-two hours of operations.

[65]*Unit of Action O&O Change 1,* 4-81. Pulsed sustainment at the tactical level is defined as the intermittent multi-modal flow of goods and services (to include personnel services) integrated into the maneuver commander's battle rhythm to sustain or rebuild combat power. It eliminates the requirement to maintain a secure LOC at all times and in all places within a non-contiguous battle space.

Chapter 5

Conclusions and Recommendations

Conclusions

The rapid power projection and the decisive operations that are expected to be the hallmarks of the Objective Force's Unit of Action depend, to a large extent, on the modernization of existing technology or the creation of new technologies that are currently pure concept. As is emphasized by the conceptual construct of see first, understand first, act first, and finish decisively, information about the enemy is the first step to a decisive operation. To this end, the development of new technologies are expected to facilitate the execution of all four tenets of this construct.

While the acquisition of improved technical means by which to gather information about the enemy is critical, just as important is how we employ these new tools. The design of the Unit of Action provides numerous new tools for the commander to use to aid in the development of his understanding of his battle space. Currently, the Aviation Detachment that he owns provides the greatest organic ability to see first. By default alone, this asset becomes the first tool he has to develop his ISR plan. The ability to build a sound ISR plan hinges on several things, but key among them is how the Aviation Detachment is used to facilitate this plan.

By examining one specific scenario, an all encompassing set of vignettes is not compared side-by-side, providing an answer for any possibility, but there is an initial recognition of issues that form a basis for further evaluation in additional studies. The data available from the ATCOM/JCATS simulations proved helpful in drawing some conclusions in all the areas examined for this study, but the logistical sustainability data had to be largely gathered from other sources. Nevertheless, all the data was to some extent revealing.

At the beginning of this paper, the question posed concerned the teaming of the capabilities of the UCAR and the Comanche in the Aviation Detachment. Did this combination

provide the Unit of Action commander with the appropriate combination of tools he needed? Could this configuration of the Aviation Detachment provide the commanderthe ability to dominate the battlespace in terms of Information, Surveillance, and Reconnaissance (ISR), High Pay-off Target (HPT) strike capability, and close support of the ground maneuver elements?

In a high intensity early entry operation, the first aspect examined was the Aviation Detachment's operational performance, which equated to the ability to complete its assigned mission, while insuring it also was able to execute any tasks the O&O stated it should accomplish in this environment. Operationally, the seventy-two hour mission was a success, and the results of the ATCOM/JCATS modeling highlighted some interesting trends. The initial screening conducted by the UCARs without the Comanches resulted in no UCAR losses; the initial rotation of Comanches into the screen line without the UCAR resulted in several Comanche losses. Once the UCARs were able to team up with the Comanches, loses again dropped drastically. This, combined with a slightly better target acquisition rate for the UCAR, suggests that it could beof immense help during reconnaissance missions. The UCAR also had a higher first-kill ratio than the Comanche, but the UCAR can only carry a fraction of the munitions of the Comanche. This suggests that in an HPT attack role, or in a ground support role, a dynamic teaming of the two systems may be the optimum TTP.

The second aspect of the Aviation Detachment that was examined was its survivability. After a fairly detailed discussion of the characteristics of the Comanche and the role of the UCAR, an examination of available statistics deemed that the detachment did meet the established criteria for survivability. This affirmation, however, is a qualified one based on the fact that there is no historical data against which to compare the ATCOM/JCATS results. Lacking this data, the current survival rates from similar type units was applied with the results being notably better.

The third and final area examined was the sustainability of the Aviation Detachment. The focus of this examination was primarily on two classes of supply, ammunition and fuel, but also briefly examined maintenance. Because of the lack of logistical data from the model, external sources and data were applied to the scenario to extrapolate the Unit of Action's ability to autonomously sustain the Aviation Detachment for the requisite seventy-two hours. After evaluating some current information on the Comanche's ability to maintain sustained operations, it appears that the manner in which the Aviation detachment was employed for this simulation would not have been feasible. That is not to say that the Unit of Action could not have sustained the detachment; in all likelihood it appears that it could. What this information pointed out was that in order to realistically sustain the detachment's two troops, a different utilization of the manned and un-manned assets is required.

The overall conclusion is that the current Aviation Detachment is able to provide the Unit of Action commander with the capabilities he requires. This is a qualified conclusion in that additional analysis needs to be conducted under alternative conditions. It is likely that all the conclusions discussed within the context of the early entry operation will be applicable under most other circumstances, but to varying degrees. Even more probable will be the recognition of additional issues that need to be addressed.

Recommendations

As for an overall recommendation, the results of this study indicate that the original proposal in the 22 July 2002 Operation and Organizational Plan for twelve Comanches and eight UAVs is very close to the best possible combination of manned and unmanned platforms for the Unit of Action Aviation Detachment to accomplish the mission set forth in the same document.[66] However, the addition of one Comanche to each troop would optimize the detachment's capability and provide an additional eighteen hours of heavily-armed, manned aircraft assets available for operations. This capability

[66] *Unit of Action O&O*, 41.

would provide each troop the potential of extending the time manned assets were available, or establishing a small serge or overlap capability.

Recently, change one to the TRADOC Pamphlet 525-3-90 O&O, The United States Army Objective Force Operational and Organizational Plan Unit of Actionwas released. It affects the Aviation Detachment in two primary areas, only one of which has potential repercussions on this study. The first change is to establish and quantify the Aviation Support Troop. This change only affects the sustainment portion of this paper and was easily incorporated. The second change is somewhat more ambiguous, and yet potentiallyfar reaching. As per the new organizational design, the number of UAVs organic to the Aviation Detachment is currently under study.[67]

Since the scenario used to conduct the study employed the eight UAVs, as per the 22 July 2002 O&O, any change to those numbers would effect how the Aviation Detachment was deployed, fought and sustained. It can be surmised that an increase in the number of UAVs could have the potential for additional capabilities for the detachment, without drastic changes to the sustainment requirements. But a decrease in the number of UAVs could be drastic. As evidenced in this study, a reduction in unmanned platforms, without some augmentation from outside the detachment, would likely result in gaps in the ISR plan. Additionally, the survivability enhancement that the UAVs provide the detachment would also be reduced proportionally.

Whatever the decision of the UAV realignment is, it must be underscored by an informed understanding of the technical, logistical and operational restraints it will impose on the Unit of Action Commander. The author strongly recommends that the UAV distribution remain four per air troop within the Aviation Detachment. This, combined with the increase of one Comanche per troop will provide the Unit of Action commander with the tools he needs for full-spectrum dominance, allowing him to see the enemy first, understand the situation first, act first to position

his forces in the most advantageous position, and then commit those forces to finish his adversary decisively.

[67]*Unit of Action O&O*, 3-32.

APPENDIX A

ATCOM / JCATS Simulation results

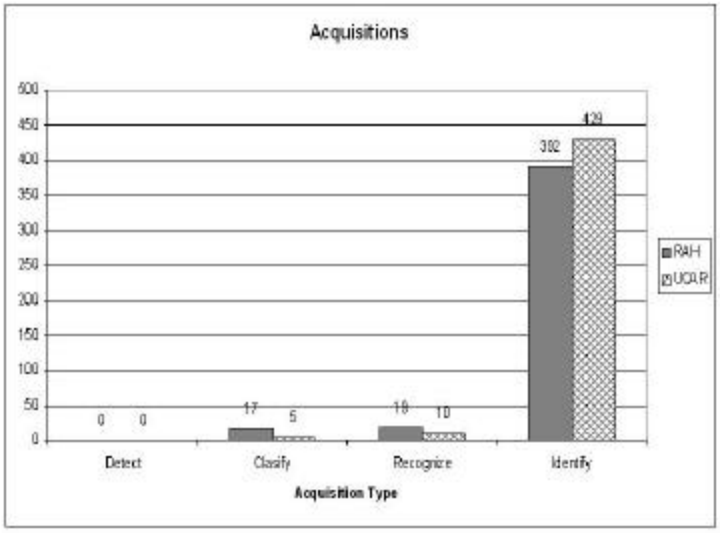

Figure 9: Acquisitions by type - enemy[68]

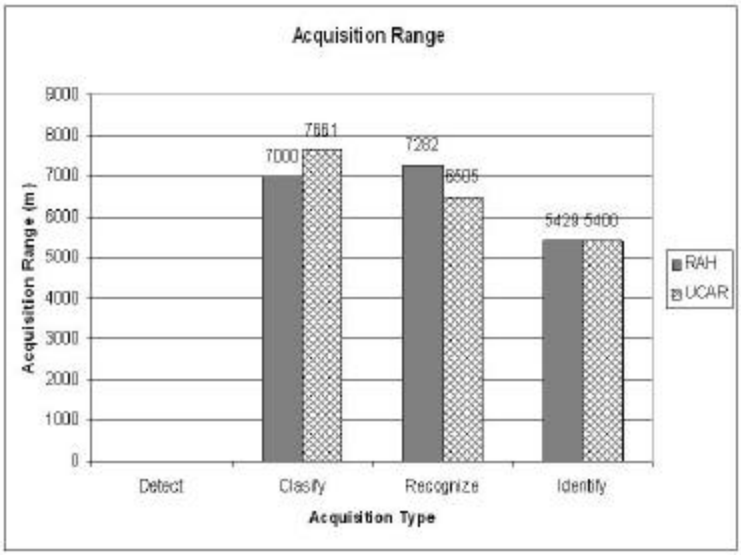

Figure 10: Acquisition by type - range[69]

[68] Jeffery L. Shafer, "Future Combat Systems-Wargame Summery".
[69] Ibid.

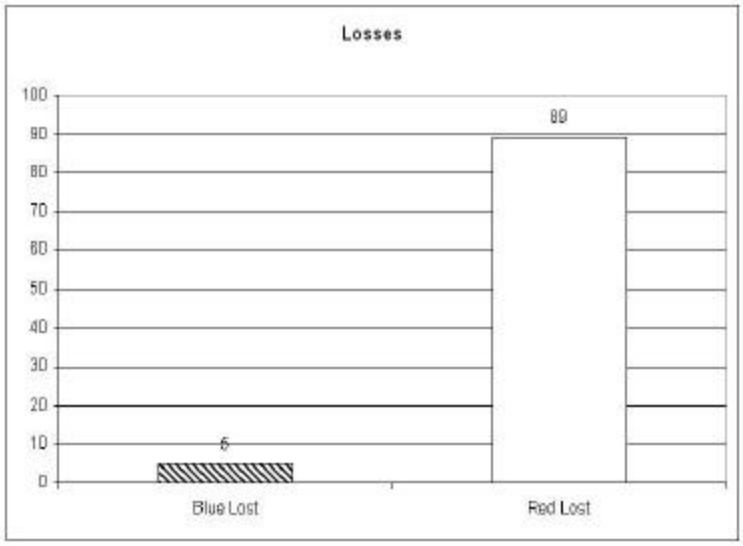

Figure 11: Losses[70]

[70]Jeffery L. Shafer, "Future Combat Systems-Wargame Summery".

APPENDIX B

TSM Comanche break down of an RAH-66 flight hour availability

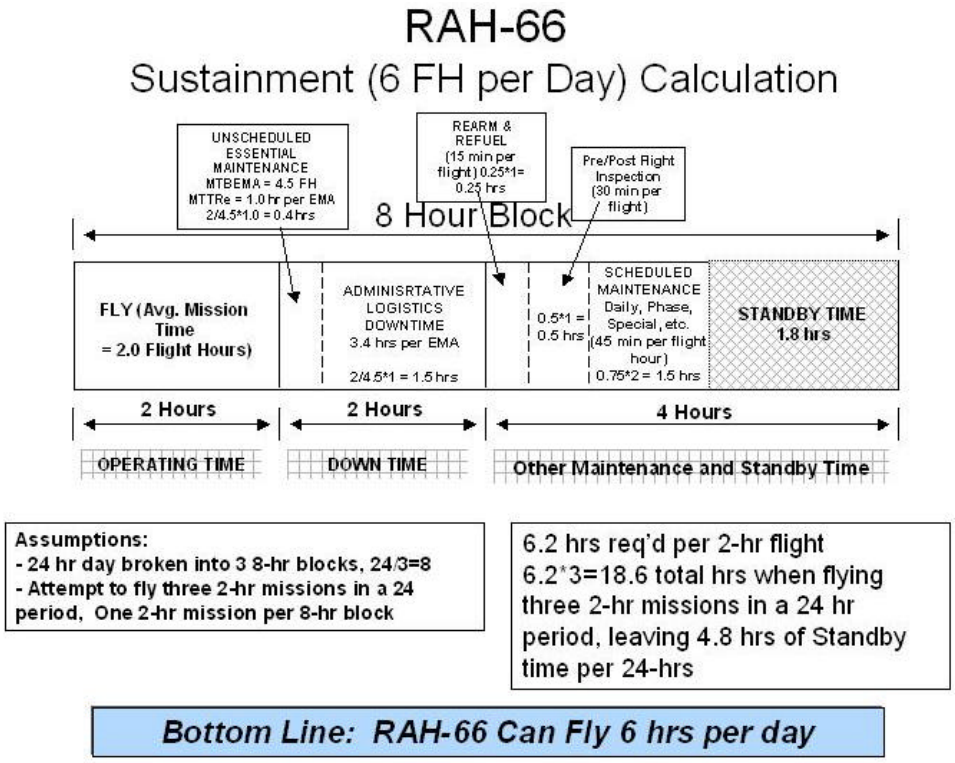

Figure 12: Flight time break-down[71]

[71] Master Sergeant Joseph Hughes [Assistant TSM Comanche], interviewed by author, 9 March 2003, Ft. Rucker, AL., e-mail.

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